ANNEX E
NITF 2.1 Complexity (Compliance) Levels

E-1 Products which implement NITF 2.1 are certified according to their ability to pack and/or unpack various CLEVELs of NITF 2.1 formatted files. This concept allows NITF 2.1 to be implemented on a wide range of products with various levels of internal resources while maintaining a baseline level of interoperability between all certified products. A product may be certified as having a pack-only capability, an unpack-only capability, or both a pack and unpack capability depending on the fielding intent and desire of product sponsor. A summary of the attributes of each CLEVEL is listed in Table E-1.

Recommend the following Table be applied to ANNEX E. Complexity (Compliance) Levels

Table E-1 Complexity Level Specification
for
NITF 2.1 Products

Complexity Level Designation		Level 3	Level 5	Level 6
Common Coordinate System Size (Pixels)		2048^2	8192^2	131072^2
Image Size Constraints		2048 x 2048	8192 x 8192	131072x131072 blocked
Image Blocking Block sizes is by row/column		Single upto 2048 Multi restricted to 16 x 16 to 1024 H or V blocks	Single upto 8192 Multi restricted to 16 x 16 to 2048 H or V blocks	Multi restricted to 16 x 16 to 2048 H or V blocks
	Single	Yes	Yes	Yes
	Multiple	Yes	Yes	Yes
Number of Images per File		20	40	100
Monochrome Images (Uncompressed)		Yes	Yes	Yes
1 bpp	Imode(s)	B	B	B
	Blocking	No	No	No

Table E-1 Complexity Level Specification for NITF 2.1 Products				
Complexity Level Designation		Level 3	Level 5	Level 6
8 bpp	Imode(s)	B	B	B
	Blocking	Single/Multi	Single/Multi	Single/Multi
12 bpp	Imode(s)	B	B	B
	Blocking	Single/Multi	Single/Multi	Single/Multi
9-16/16 bpp	Imode(s)	B	B	B
	Blocking	Yes	Yes	Yes
Monochrome Images (Compressed)		Yes	Yes	Yes
1 bpp	Bi-Level	Yes	Yes	Yes
	Compression Rates	1D, 2DS, 2DH	1D, 2DS, 2DH	1D, 2DS, 2DH
	Imodes	B	B	B
	Blocking	Single 32-2048	Single 32-2560	Single 32-2560
8 bpp	JPEG, DCT (C3)	Yes	Yes	Yes
	Sample Size	8	8	8
	Compression Rates	Embedded Custom table 00.0	Embedded Custom table 00.0	Embedded Custom table 00.0
	Imodes	B	B	B
	Blocking	Single/Multi	Single/Multi	single/Multi
8 bpp	VQ-Decompress (C4, M4)	Yes	Yes	Yes
	Sample Size	8	8	8
	Compression Rates	Embedded table n.nn	Embedded table n.nn	Embedded table n.nn
	Imodes	B	B	B

Table E-1 Complexity Level Specification for NITF 2.1 Products				
Complexity Level Designation		Level 3	Level 5	Level 6
	Blocking	Single/Multi	Single/Multi	Single/Multi
8 bpp w/LUT	VQ-Decompress (C4, M4)	Yes	Yes	Yes
	Sample Size	8	8	8
	Compression Rates	Embedded table n.nn	Embedded table n.nn	Embedded table n.nn
	Imodes	B	B	B
	Blocking	Single/Multi	Single/Multi	single/Multi
12 bpp	JPEG, DCT	Yes	Yes	Yes
	Sample Size	12	12	12
	Compression Rates	Custom	Custom	Custom
	Imodes	B	B	B
	Blocking	Single/Multi	Single/Multi	single/Multi
9-16/ bpp	JPEG, DCT	Yes	Yes	Yes
	Sample Size	12	12	12
	compression Rates	Custom	Custom	Custom
	Imodes	B, S	B, S	B, S
	Blocking	Single/Multi	Single/Multi	Single/Multi
Color Images (Uncompressed)				
1 bpp	RGB/LUT	Yes	Yes	Yes
	Imode(s)	B	B	B
	Blocking	Single	Single	Single
8 bpp (1 band)	RGB/LUT	Yes	Yes	Yes
	Imode(s)	B	B	B

Table E-1 Complexity Level Specification
for
NITF 2.1 Products

Complexity Level Designation		Level 3	Level 5	Level 6
	Blocking	Single/Multi	Single/Multi	Single/Multi
24 bpp (3 band)	RGB	Yes	Yes	Yes
	Imode(s)	B, P, S	B, P, S	B, P, S
	Blocking	Single/Multi	Single/Multi	Single/Multi
Color Images (Compressed)				
1 bpp	Bi-Level/LUT	Yes	Yes	Yes
	RGB/LUT	Yes	Yes	Yes
	Imode(s)	B	B	B
	Blocking	Single	Single	Single
8 bpp (1band)	VQ	Yes	Yes	Yes
	RGB/LUT	Yes	Yes	Yes
	Imode(s)	B	B	B
	Blocking	Single/Multi	Single/Multi	Single/Multi
24 bpp (3 band)	JPEG,DCT	Yes	Yes	Yes
	YCbCr	Yes	Yes	Yes
	Imode(s)	P	P	P
	Blocking	Yes	Yes	Yes
Multi Spectral (Uncompressed) (2-256 bands)		Yes	Yes	Yes
8 bpp	**Imode(s)**	B	B	B
	Blocking	Single/Multi	Single/Multi	Single/Multi
12 bpp	**Imode(s)**	B	B	B
	Blocking	Single/Multi	Single/Multi	Single/Multi

Table E-1 Complexity Level Specification for NITF 2.1 Products				
Complexity Level Designation		Level 3	Level 5	Level 6
11-16/16 bpp	**Imode(s)**	B	B	B
	Blocking	Single/Multi	Single/Multi	Single/Multi
Multi Spectral (Compressed) (2-256 bands)		Yes	Yes	Yes
8 bpp	**JPEG,DCT**	Yes	Yes	Yes
	Sample Size	8	8	8
	Compression Rate	Custom	Custom	Custom
	Imode(s)	B	B	B
	Blocking	Single/Multi	Single/Multi	Single/Multi
12 bpp	**JPEG,DCT**	Yes	Yes	Yes
	Sample Size	12	12	12
	Compression Rate	Custom	Custom	Custom
	Imode(s)	B	B	B
	Blocking	Single/Multi	Single/Multi	Single/Multi
9-16/16 bpp	**JPEG,DCT**	Yes	Yes	Yes
	Sample Size	16	16	16
	Compression Rate	Custom	Custom	Custom
	Imode(s)	B	B	B
	Blocking	Single/Multi	Single/Multi	Single/Multi
Symbol Overlays (Graphic)		Yes	Yes	Yes
	Number Allowed Per File	100	100	100
CGM Symbol		Yes	Yes	Yes
	Graphic	Yes	Yes	Yes
	Annotation(Text)	Yes	Yes	Yes

Table E-1 Complexity Level Specification for NITF 2.1 Products				
Complexity Level Designation		Level 3	Level 5	Level 6
	Aggregate size (bytes)	**524,288**	**1,048,576**	**2,097,152**
Text				
	Number of Components Allowed Per File	0-32	0-32	0-32
	Aggregate Character Constraints	**100,000**	**100,000**	**100,000**
Controlled Tags				
	File Header	Yes	Yes	Yes
	Image Sub-Header	Yes	Yes	Yes
	Symbol Sub-Header	Yes	Yes	Yes
	Text Sub-Header	Yes	Yes	Yes
Registered Tags				
	File Header	Yes	Yes	Yes
	Image Sub-Header	Yes	Yes	Yes
Data Extension Segments				
	CETAG Overflow	Yes	Yes	Yes
	RETAG Overflow	No	No	No
	Encapsulated	Yes	Yes	Yes
	TFS	Yes	Yes	Yes
	PIKS Objects			
	Histogram	Yes	Yes	Yes
	LUT	Yes	Yes	Yes

Table E-1 Complexity Level Specification for NITF 2.1 Products				
Complexity Level Designation		Level 3	Level 5	Level 6
	ROI			
	MATRIX			
	Neighborhood Array			
	Tuple			
	Time Stamp	Yes	Yes	Yes
	History Log	Yes	Yes	Yes

E-2 NITF 2.1 CERTIFICATION TEST FUNCTIONAL REQUIREMENTS

A. NITF 2.1 PACK. A product must be able to pack NITF 2.1 compliant files within the constants of its CLEVEL. A product must at least support packing the NITF 2.1 CLEVEL attributes corresponding with those available in its native mode of operation. For example, if the system supports annotation using symbols in its native mode, it must support graphic symbology and possibly annotation according to the NITF 2.1 standard. If the product has an image capture or input device, it must support the CLEVELs of the image size(s) that can be captured. Additionally, the product must support the maximum boundary conditions for the supported CLEVEL. Products applying for CLEVEL5 and above will be required to exchange imagery with lower level products. Large images must be packed into lower CLEVEL files through either sub-sampling the image, which shrinks it down to the appropriate size, or cutting out the desired portion of that image. The product is not required, however, to implement all NITF 2.1 attributes available at any particular CLEVEL. For example, some products do not support the creation of all the CGM element graphics when packing an NITF 2.1 file but must unpack and display all CGM graphics that are profile endorsed. The set of pack features implemented is somewhat at the discretion of the system sponsor. It is the responsibility of those acquiring or intending to use a particular product to ensure that the needed packing features are present. Whatever set of features are implemented, they must be done within the constraints of the appropriate CLEVEL and will be thoroughly tested. An operator that generates an NITF 2.1 file must have a means to ensure that the file generated meets the specific level intended and does not exceed the boundary conditions for that CLEVEL file type.

B. NITF 2.1 UNPACK. A product must be able to unpack any NITF 2.1 compliant file at the CLEVEL for which certification is desired. The product certification for unpack must be equal to or greater than its CLEVEL for packing. It must also unpack any

NITF 2.1 file packed at a lesser level. Hence, there is a stringent requirement for an unpacker to be robust enough to handle all NITF 2.1 file features (even if it can't pack the feature) that may be invoked by any packing product of equal CLEVEL or below. A product attempting to unpack a file packed at a higher CLEVEL may do its best to properly interpret and use the file. If the interpretation fails, the product must alert the operator of the event and must not adversely disrupt its operation (such as requiring a re-boot or re-initialization of the product) without alerting the operator of the potential for disruption of operation.

C. INTEROPERABILITY MODE. All digital imagery products must be capable of performing the basic NITF 2.1 file and/or message processing functions associated with each lower CLEVEL below that to which it is certified. All products must be able to unpack any lower level compliant NITF 2.1 file. All products must be able to pack an NITF 2.1 file of each CLEVEL below which it is certified. The product must pack NITF 2.1 files of a each lower LEVEL with contents that do not exceed the boundary conditions for each respective CLEVEL. All NITF 2.1 files must be marked at the lowest CLEVEL that supports unpacking of the file, regardless of the maximum CLEVEL capability of the packing product.

D. COMMON COORDINATE SYSTEM SIZE. One of the differentiators between CLEVELs in Table E-1 is the Common Coordinate System size constraint. These constraints define the boundary rectangle of the combined displayable elements (images, symbols graphics and annotation graphics) contained within an NITF 2.1 file for each respective CLEVEL. All pack capable products must constrain the size and location of displayable elements within the boundary of the respective CLEVEL of the file being packed. All unpack capable products must support the full extent of the Common Coordinate System size of the CLEVELs for which certification is sought.

E. IMAGE COMPRESSION

1. JPEG. All products must support JPEG compression/decompression using at least the Discrete Cosine Transform (DCT), Huffman Entropy Encoding, and 8-bit precision mode of operation. Products supporting CLEVEL 5 and 6 must also compress/decompress at a 12 bit precision mode of operation. Products must support the use of restart markers in the compressed data.

2. Bi-Level. All unpack capable products must support unpacking Bi-Level Group Three compression/decompression using the Huffman Entropy Encoding. They must support unpacking in all three modes: One-Dimensional coding, Two-Dimensional coding with standard vertical resolution, and Two-Dimensional coding with high vertical resolution.

3. VQ (Decompression). Support of VQ decompression is not mandatory; however, if implemented, the product must comply with the specifications and guidance agreed upon and applied to this document.

F. CGM GRAPHICS. All products must support unpacking NITF 2.1 files that

contain CGM metafiles. Those products that support annotation using symbols in their native mode must support packing of CGM Graphics.

G. BIT-MAPPED SYMBOLS. NITF 2.1 products do not support the generation of Bit-Mapped symbols, however, for the purpose of complete interpretation and display of NITF 2.0 files it is recommended that NITF 2.1 products support bit-map symbols.

H. MONOCHROME. All products must support unpacking monochrome image files.

I. COLOR. All products must support unpacking color component (images and graphics) files.